

2/22/16 "Its always too early to quit." -Norman Peale

HW: Text page 307-308 #8-30 even  
Test 1 on Friday 2/26

AIM: How do we solve exponential equations?

Warm Up:

Express each number as a power ex)  $9 = 3^2$

1)  $25 = 5^2$

2)  $1000 = 10^3$

3)  $\frac{1}{8} = \frac{1}{2^3} = \left(\frac{1}{2}\right)^3$   
 $\downarrow$   
 $8^{-1} = (2^3)^{-1} = 2^{-3}$

4)  $0.001$

$\frac{1}{1000} = \frac{1}{10^3} = 10^{-3}$   
 . Tenths    Hundredths    Thousandths

Solve each of the following and check:

5)  $3^x = 3^{2x-2}$

$$\begin{array}{r} x = 2x - 2 \\ -x \quad -x \\ \hline 0 = x - 2 \\ +2 \quad +2 \\ \hline x = 2 \end{array}$$

6)  $2^{2x} = 8$

$$2^{2x} = 2^3$$

$$\frac{2x}{2} = \frac{3}{2}$$

$$x = 1.5$$

$3^x$  ← Exponent  
3 ← BASE

$2 = 3$  IF The BASES are =  
 $9 = 3^x$  the exp. are =  
 $9 = 3^2$   
 $x = 2$

STEP 1  
Are the Bases = ?

STEP 2  
Can you change the # so the bases are = ?

IF the base are =  
The exp. are =

If the bases of an exponential equation are the same, then set the exponents equal and solve.

If the bases are not the same, try to re-write **one or both** of them in order to get a common base. (Use powers)

7)

$$5^{x-1} = .04$$

$$5^{x-1} = \frac{1}{25}$$

$$5^{x-1} = \frac{1}{5^2}$$

$$5^{x-1} = 5^{-2}$$

$$x-1 = -2$$

$$\begin{array}{r} x-1 = -2 \\ +1 \quad +1 \\ \hline x = -1 \end{array}$$

$$\frac{1}{5^2} = \left(\frac{1}{5}\right)^2$$

8)  $(9)^x = 27$

$$(3^2)^x = 3^3$$

$$3^{2x} = 3^3$$

$$\frac{2x}{2} = \frac{3}{2}$$

$$x = 1.5$$

HW check:

$$8) 32 = \boxed{2^5}$$

$$10) \frac{1}{216} = \frac{1}{6^3} = \boxed{6^{-3}}$$

$$12) .125 = \frac{125}{1000} = \frac{5^3}{10^3}$$

$$\left(\frac{5}{10}\right)^3 = \boxed{\left(\frac{1}{2}\right)^3}$$

$$14) .16 = \frac{4}{25} = \frac{2^2}{5^2} = \boxed{\left(\frac{2}{5}\right)^2}$$

$$16) \quad 3^x = 27$$

$$\quad \quad \quad \downarrow$$

$$3^{\cancel{x}} = 3^{\cancel{3}}$$

$$x = 3$$

$$18) \quad 7^x = \frac{1}{49}$$

$$7^x = 49^{-1}$$

$$7^x = (7^2)^{-1}$$

$$7^{\cancel{x}} = 7^{\cancel{-2}}$$

$$x = -2$$

$$20) \quad 3^{\cancel{x+1}} = 3^{\cancel{2x+3}}$$

$$x+1 = 2x+3$$

$$x = -2$$

$$\begin{array}{r} x+1 = 2x+3 \\ -x \quad -x \\ \hline 1 = x+3 \\ -3 \quad -3 \\ \hline -2 = x \end{array}$$

$$22) \quad 3^{x+2} = (9)^x$$

$$3^{x+2} = (3^2)^x$$

$$3^{\cancel{x+2}} = 3^{\cancel{2x}}$$

$$x+2 = 2x$$

$$-x \quad -x$$

$$\hline 2 = x$$

$$24) (49)^x = 7^{3x+1}$$

$$(7^2)^x = 7^{3x+1}$$

$$7^{2x} = 7^{3x+1}$$

$$2x = 3x + 1$$

$$\begin{array}{r} 2x = 3x + 1 \\ -2x \quad -2x \\ \hline 0 = x + 1 \end{array}$$

$$\begin{array}{r} 0 = x + 1 \\ -1 = x \end{array}$$

9)  $(4)^{x+1} = (8)^x$

$(2^2)^{x+1} = (2^3)^x$

$2^{2x+2} = 2^{3x}$

$2 = 2$

$$\begin{array}{r} 2x+2 = 3x \\ -2x \quad -2x \\ \hline 2 = x \end{array}$$

10)  $\left(\frac{1}{9}\right)^x = 27^{1-x}$

$(9)^{-x} = (27)^{1-x}$

$(3^2)^{-x} = (3^3)^{1-x}$

$3^{-2x} = 3^{3-3x}$

$$\begin{array}{r} 3-3x = -2x \\ +3x \quad +3x \\ \hline 3 = x \end{array}$$



HW: Review Sheet  
#1-6 due tomorrow  
#7-21 due Thursday